



CH2MHILL

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November 25, 2002

176784.A0.01.02

Rand Crafts
Intermountain Power Service Corporation
850 West Brush Wellman Road
Delta, Utah 84624

Subject: IPP Over-Fire Air Project: Carbon Monoxide Impacts

Dear Rand:

This letter presents a summary of our analysis of potential carbon monoxide (CO) impacts from the proposed addition of over-fire air to the existing Units 1 and 2 (OFA Project) at the Intermountain Power Project (IPP). CH2M HILL evaluated the impact from the CO emissions resulting from the OFA Project on the following:

- Class II area National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increments
- Class I area PSD increments and air quality related values (AQRVs)

The IPP is situated in an area that is designated as attainment for all criteria pollutants, while the surrounding areas are designated as Class II areas for PSD permitting.

Intermountain Power Service Corporation (IPSC) requested that CH2M HILL conduct the analysis described here. The scope of the project was summarized in our proposal to IPSC dated November 12, 2002. This report provides an overview of the analysis, including dispersion modeling inputs and results.

Selected Model

To evaluate air quality impacts in the Class II areas surrounding the IPP, CH2M HILL used the EPA Industrial Source Complex Short-Term (ISCST3) dispersion model. The ISCST3 model (Version 02305) is the latest generation of the EPA model that is recommended for predicting impacts from industrial point sources. The model combines simple terrain and complex terrain algorithms, which make it ideal for the terrain surrounding the IPP. The selected model is the same model that was proposed for use with the Intermountain Power Project (IPP) Unit 3 Project and approved for use by the Utah Division of Air Quality (UDAQ).

The ISCST3 model was run with EPA regulatory default options, with the addition of the model option for processing missing meteorological data. By using the missing data processing routine, the model can recognize the periods of missing data and adjust calculated impacts in the same manner that calm winds are processed.

Meteorological Input

For meteorological input to the ISCST3 model, CH2M HILL used data collected from the 50-meter (m) level from the meteorological monitoring station at the IPP. Data from the IPP station meet all EPA requirements for consideration as representative of the IPP. The period of record represented by the data is the most current, as the continuous collection of meteorological data began at the IPP station on July 19, 2001. A full calendar year of data was used for the modeling, spanning from August 1, 2001 to July 31, 2002. Twice-daily mixing heights to couple with the on-site surface data were obtained through the use of raw upper-air data from the Salt Lake City National Weather Service station, and the EPA Mixing Heights Program. Figure 1 presents a wind rose for the 50-m data.

Receptor Grid

The base receptor grid for ISCST3 modeling consisted of receptors that were placed at the ambient air boundary, and Cartesian-grid receptors that were placed beyond the boundary at spacing that increased with distance from the origin. Ambient boundary receptors were placed at 50-m intervals. Beyond the ambient boundary, receptor spacing was as follows:

- 100-m spacing from property boundary to 1 kilometer (km) from the origin
- 250-m spacing from beyond 1 km to 3 km from the origin
- 500-m spacing from beyond 3 km to 20 km from the origin
- 1,000-m spacing from beyond 20 km to 50 km from the origin

Terrain in the vicinity of the IPP was accounted for by assigning elevations to each modeling receptor. CH2M HILL used Digital Elevation Model (DEM) data from the U.S. Geological Survey (USGS) to determine receptor elevations. We obtained DEM data from the USGS National Elevation Dataset (NED). The NED has been developed by merging the highest-resolution, best-quality elevation data available across the United States, and is the result of the USGS effort to provide 1:24,000-scale (7.5-minute) DEM data for the entire continental United States. Figure 2 presents a depiction of terrain features near the IPP.

Building Downwash

Building downwash effects for structures near Units 1 and 2 were determined with the EPA Building Profile Input Program (BPIP, version 95086).

Emissions and Exhaust Parameters

Rather than attempt to estimate and evaluate the CO emissions increase from the OFA Project alone, the maximum 1-hour and 8-hour emissions from full operation of each unit (at various loads, after approved uprate modifications) were input to the ISCST3 model. This represents a conservative approach to estimating the impacts from the OFA Project. Attachment 1 presents the modeled emissions and exhaust parameters for each load condition.

Maximum 1-hour emissions for the modeling analysis were calculated from data collected during the 1988 acceptance testing for Units 1 and 2. During those acceptance tests, the highest recorded CO value for either unit over a two-hour period 0.263 lb/MMBtu. To arrive at a conservative estimate of worst-case 1-hour emissions at approved full uprate load operation, the value of 0.263 lb/MMBtu was multiplied by the maximum heat input for full load (9,225 MMBtu/hr). To arrive at emissions for reduced loads (75% load and 50% load), the 0.263 lb/MMBtu value was multiplied by the heat inputs expected at the particular reduced load. Exit velocities for reduced load conditions were calculated by scaling the flow at 100% load to reflect the expected flow at 75% and 50% loads.

The manufacturer of the OFA Project equipment has guaranteed a steady-state CO emission rate of 0.064 lb/MMBtu. To estimate maximum 8-hour emissions, the manufacturer's guaranteed emission rate of 0.064 lb/MMBtu was multiplied by the expected heat input for each unit at 100%, 75%, and 50% loads.

Because the Unit 1 and Unit 2 flues are released from a common shell (stack) location, both units were modeled with a common pair of Universal Transverse Mercator (UTM) coordinates, representing the center of the common stack. Similarly, because the maximum estimated emissions are identical for each unit, the two sources were modeled as a single point source, with the emissions for a single unit doubled to represent both units within the model.

Results

CH2M HILL compared the highest 1-hour and 8-hour impacts predicted by the ISCST3 model for 100%, 75%, and 50% loads to the Class II Area modeling significance levels. The highest predicted 1-hour impact was 399.4 $\mu\text{g}/\text{m}^3$. This impact was estimated to occur with 100% load, approximately 35 km west-northwest of the Units 1 and 2 stack, and in an area with receptor spacing of 1,000 m. According to modeling guidelines published by the UDAQ: "In general, the receptor network will be considered adequate if the difference in concentrations at neighboring receptors is no larger than one half the difference between the maximum modeled concentration and the NAAQS or increment under consideration" (UDAQ, 2000). In this case, the air quality standard under consideration is the Class II modeling significance level, and one half of the difference between the maximum modeled concentration (399.4 $\mu\text{g}/\text{m}^3$) and the modeling significance level (2,000 $\mu\text{g}/\text{m}^3$) is

approximately 800 $\mu\text{g}/\text{m}^3$. The difference between concentrations at neighboring receptors is much less than 800 $\mu\text{g}/\text{m}^3$, and therefore the receptor network was adequate to capture the maximum 1-hour impacts of CO.

The maximum 8-hour impact of 24.7 $\mu\text{g}/\text{m}^3$ also occurred with 100% load operation. This impact occurred approximately 2.5 km south of the Units 1 and 2 stack in an area with 250-m receptor spacing. As with the maximum predicted 1-hour concentration, the difference between concentrations at neighboring receptors is much less than one half of the difference between the maximum modeled concentration and the modeling significance level (500 $\mu\text{g}/\text{m}^3$), and therefore the receptor network was adequate to capture the maximum 8-hour impacts of CO.

The maximum predicted 1-hour concentration of CO is less than 20% of the modeling significance level, while the maximum 8-hour concentration is less than 5% of the modeling significance level. These modeled impacts were conservatively predicted for full operation of both units after completion of the OFA Project as opposed to simply evaluating the increase in CO emissions that would be expected from the project. Therefore the analysis demonstrates that air quality impacts of CO from Units 1 and 2 after completion of the OFA Project will be insignificant, and Class II NAAQS and PSD increments will not be threatened.

TABLE 1
Maximum Estimated Carbon Monoxide Impacts

Averaging Period/Load	Maximum Estimated Impact ($\mu\text{g}/\text{m}^3$)	UTM Location	Class II Area Modeling Significance Level ($\mu\text{g}/\text{m}^3$)
1-hour/100% Load	399.4	330,054 m East 4,382,464 m North	2,000
1-hour/75% Load	360.0	366,054 m East 4,401,464 m North	2,000
1-hour/50% Load	311.0	366,054 m East 4,401,464 m North	2,800
8-hour/100% Load	24.7	364,804 m East 4,371,964 m North	500
8-hour/75% Load	21.4	364,804 m East 4,371,964 m North	500
8-hour/50% Load	16.9	365,054 m East 4,376,464 m North	500

Notes:
 $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter
UTM = universal transverse mercator
m = meters

Air Quality and AQRVs in Class I Areas

The IPP plant is located within 150 km of Capitol Reef National Park (NP) in Utah, the nearest Class I area to the IPP. The plant is located within 250 km of several other Class I areas in Utah, including Zion NP, Bryce Canyon NP, and Canyonlands NP. Because of the presence of these Class I areas, CH2M HILL evaluated the potential impacts of CO emissions from the Units 1 and 2 OFA Project on Class I area air quality and AQRVs.

No Class I area PSD increments have been established for CO. Therefore, the OFA Project will not cause or contribute to a violation of a Class I area PSD increment.

To evaluate the effect of CO emissions from the OFA Project on Class I area AQRVs, CH2M HILL examined the document titled *Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report* (FLAG, 2000) to determine the Class I AQRVs that are of most concern to the Federal Land Managers (FLM). The goal of the FLAG process has been to provide consistent policies and processes both for identifying AQRVs and for evaluating the effects of air pollution on AQRVs, primarily those in Federal Class I air quality areas.

Details are provided in the FLAG document for the types of analyses that should be conducted for AQRVs. These analyses include: visibility impacts, acid deposition of sulfur and nitrogen compounds, and ozone effects on vegetation. Carbon monoxide is an air pollutant that does not contribute to visibility degradation, acid deposition, or ozone formation. Therefore, CO emissions from the OFA Project will not adversely affect any Class I area AQRVs.

List of Files

ISCST3 modeling files are included with this report on CD. The file names and descriptions are as follows:

IPP_CO_1.DTA(.LST) – ISCST3 input (.DTA) and output (.LST) files for maximum 1-hour CO impacts

IPP_CO_8.DTA(.LST) – ISCST3 input (.DTA) and output (.LST) files for maximum 8-hour CO impacts

IPP50M.MET – Meteorological input file

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References

UDAQ, 2000. *Utah Division of Air Quality Modeling Guidelines (Revised Draft)*, Utah Division of Air Quality, Technical Analysis Section, August 17, 2000.

FLAG, 2000. *Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report*, December 2000.

Please contact me at (720) 286-5362 if you have any questions.

Sincerely,

CH2M HILL

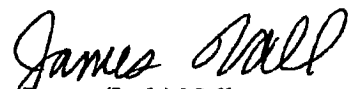

James (Josh) Nall
Air Quality Meteorologist

Figure 1 – Wind Rose

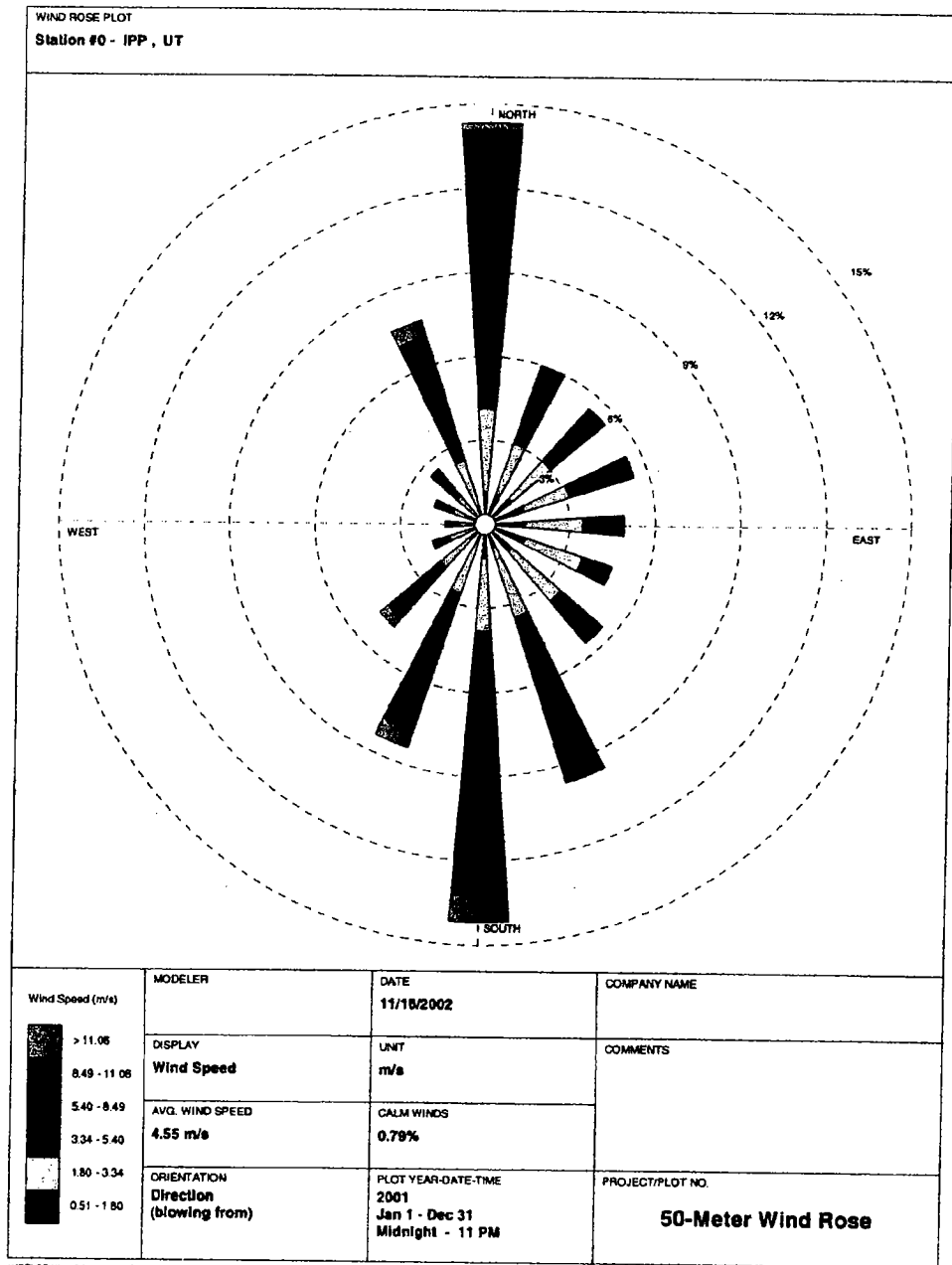
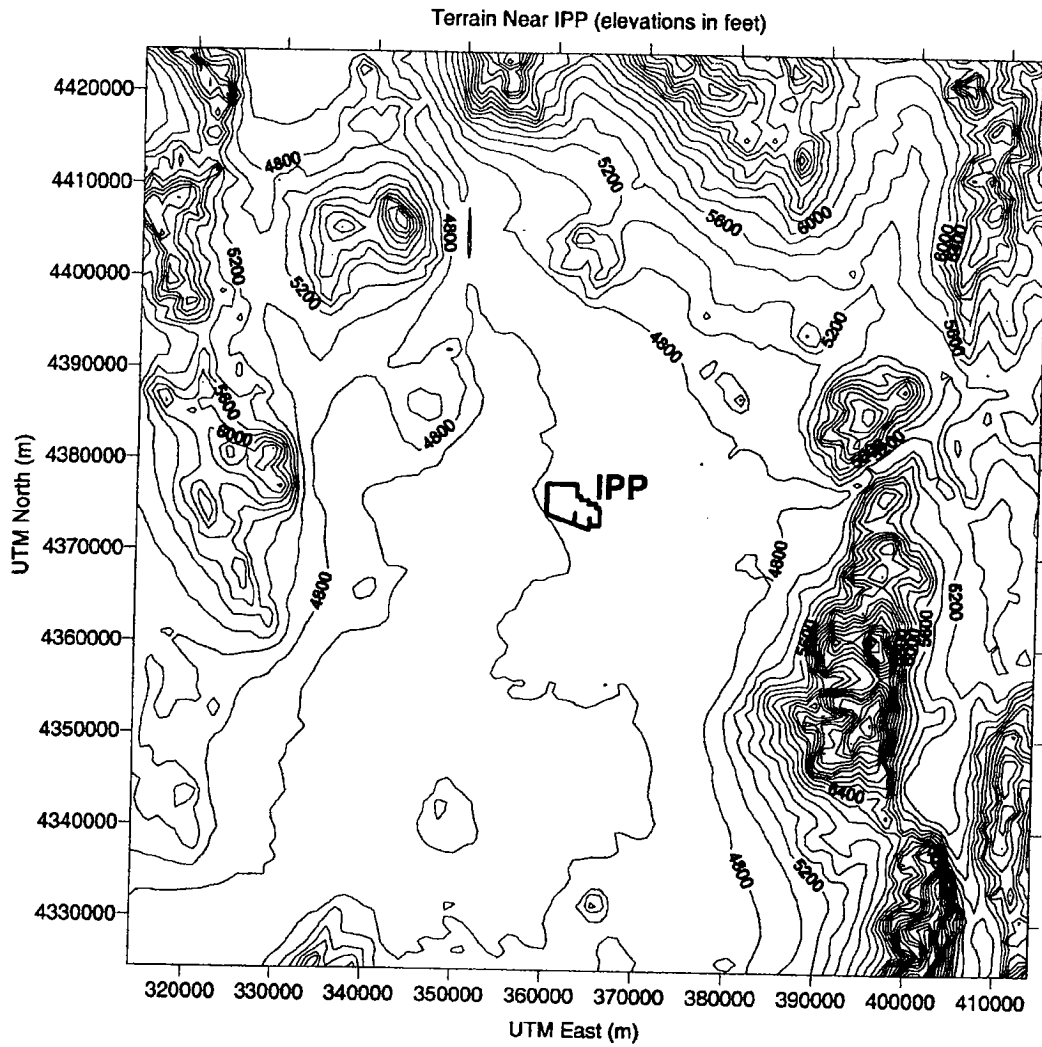


Figure 2 – Terrain Features



ATTACHMENT 1

IPSC CO Modeling for OFA Project

Modeling Input Summary - Unit 1

Modeling Scenario	Heat Input MMBtu/hr	Stack Height ft	Stack Diameter ft	Stack Flowrate acfm	Exit Velocity ft/sec	Exhaust Temperature °F	1-Hour CO Emissions lb/hr	8-Hour CO Emissions lb/hr
Full Load Operation - 100%	9,225	712	28.0	3,056,345	82.7	115	2,426.18	590.40
Partial Load Operation - 75%	6,919	712	28.0	2,292,259	62.0	115	1,819.63	442.80
Partial Load Operation - 50%	4,613	712	28.0	1,528,173	41.4	115	1,213.09	295.20

Modeling Input Summary - Unit 2

Modeling Scenario	Heat Input MMBtu/hr	Stack Height ft	Stack Diameter ft	Stack Flowrate acfm	Exit Velocity ft/sec	Exhaust Temperature °F	1-Hour CO Emissions lb/hr	8-Hour CO Emissions lb/hr
Full Load Operation - 100%	9,225	712	28.0	3,056,345	82.7	115	2,426.18	590.40
Partial Load Operation - 75%	6,919	712	28.0	2,292,259	62.0	115	1,819.63	442.80
Partial Load Operation - 50%	4,613	712	28.0	1,528,173	41.4	115	1,213.09	295.20

Modeling Input Summary - Unit 1+2 (metric)

Modeling Scenario	Heat Input MMBtu/hr	Stack Height m	Stack Diameter m	Stack Flowrate acfm	Exit Velocity m/sec	Exhaust Temperature K	1-Hour CO Emissions g/s	8-Hour CO Emissions g/s
Full Load Operation - 100%	9,225	217.0	8.53	3,056,345	25.21	319	611.40	148.78
Partial Load Operation - 75%	6,919	217.0	8.53	2,292,259	18.91	319	458.55	111.59
Partial Load Operation - 50%	4,613	217.0	8.53	1,528,173	12.61	319	305.70	74.39

Assumptions:

- 1) The manufacturer has provided a steady-state CO emission guarantee of 0.064 lb/MMBtu. The 8-hour CO modeled average (lb/hr) is based on this value.
- 2) The maximum CO recorded during the 1988 Units 1 and 2 acceptance test was 0.263 lb/MMBtu averaged over a period of two hours. The 1-hour CO modeled average (lb/hr) is based on this value.
- 3) $\text{lb/hr CO} = \text{lb/MMBtu CO} \times \text{MMBtu/hr Heat Input}$.
- 4) Stack flow and stack exit velocity were estimated for 75% and 50% load conditions.